Pacing characteristics of whole and part-game players in professional rugby union

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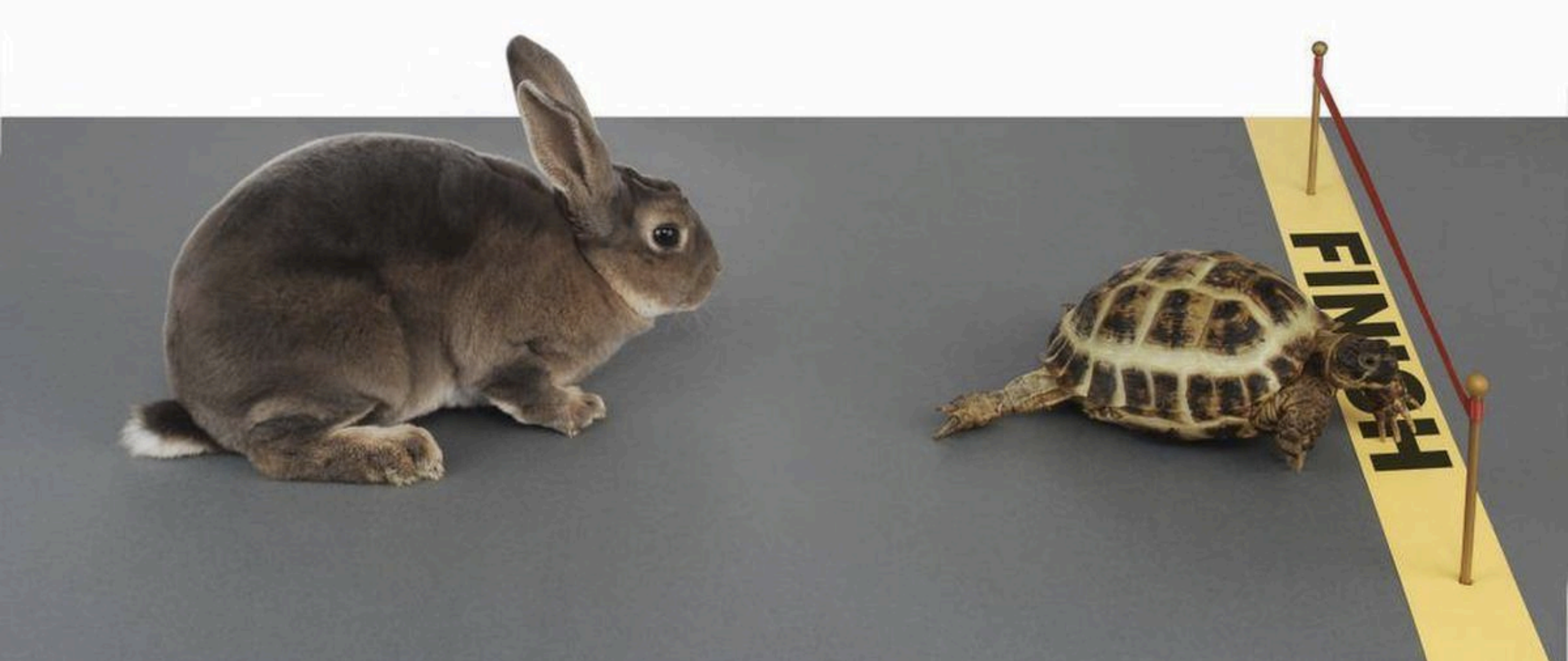
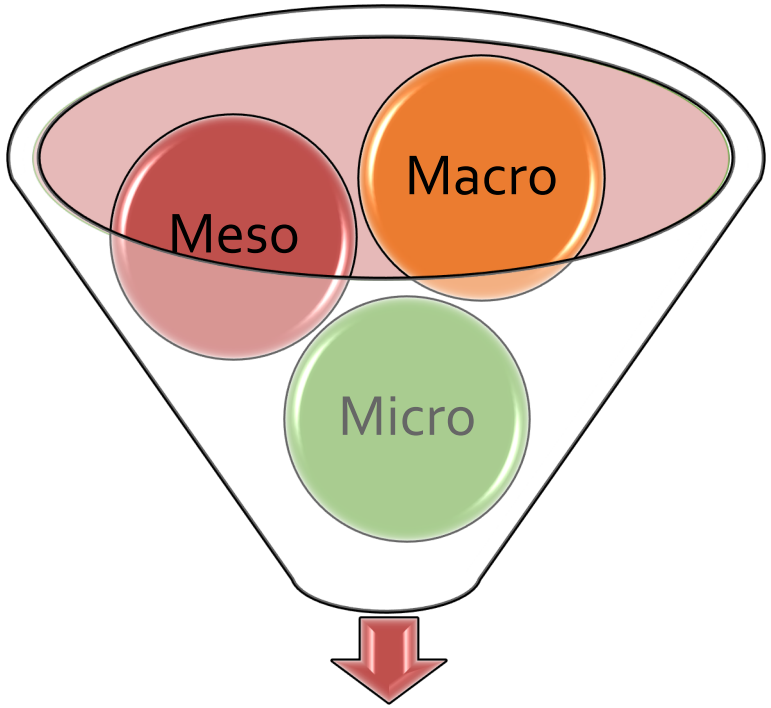
What is pacing?



What does pacing look like in team sports?

Fatigue ≠↓ in total and high-intensity running distance

(Waldron and Highton, 2014, Sports Med 44:12)



Pacing schema

Distribution of energy resources

Macro-pacing (pre-match)

- hydration, fuel availability, motivation, temperature, opposition, whole-game/substitute

Meso-pacing (half time)

- homeostatic disturbance, opposition, scoreline

Micro-pacing (continuous)

- homeostatic disturbance, opposition, scoreline

Edwards and Noakes, 2009, Sports Med 39:1

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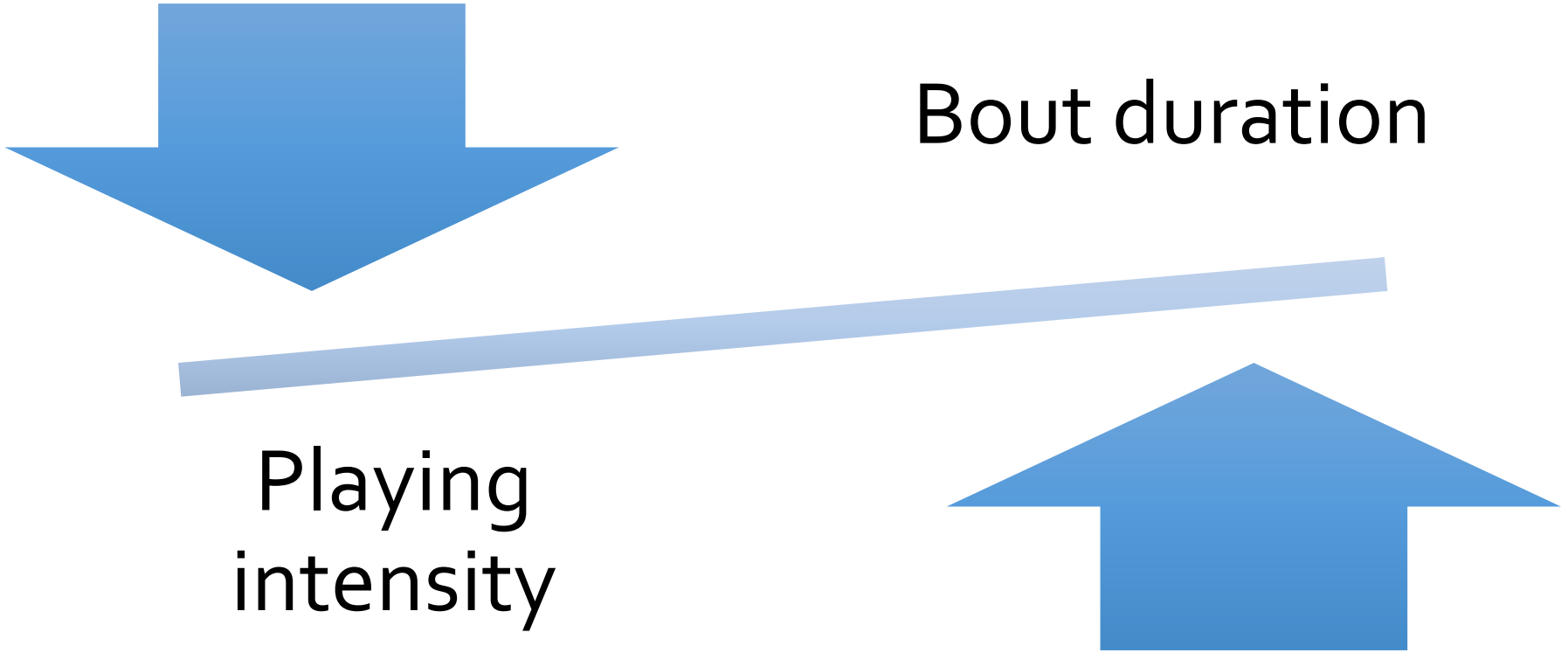
Effect of bout duration



Gabbett, Walker, & Walker (2015) IJSPP; Highton, Mullen, & Twist (2017) IJSPP; Sampson, Fullagar, & Gabbett (2015) JSS

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What does this look like in collision sport?

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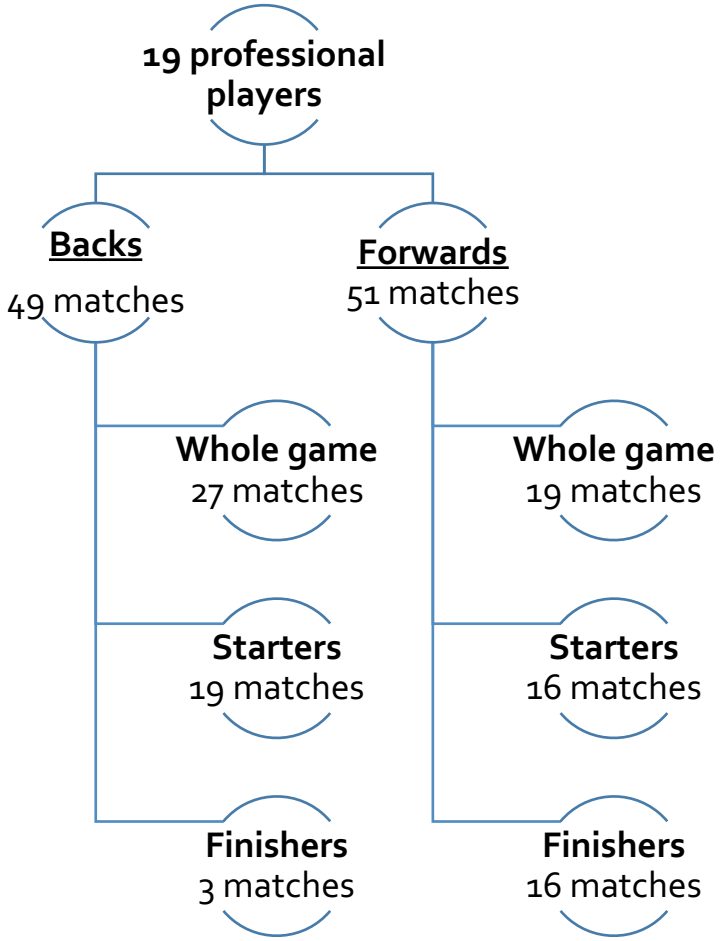
Methods



Measurement

SPI Pro GPS unit (GPSports, Canberra)

Match demand metrics

- Total distance
- High speed distance (>4 $m.s^{-1}$)
- Acceleration count (>2.75 $m.s^{-2}$)
- Impact count (> 5G)

All normalized to playing time and divided into quartiles

Statistics

Linear mixed models &
Magnitude based decisions

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Results – Bout duration effects

Table I. Comparison of locomotive match performance variables according to participation bout type (whole game, starters and finishers) for forward and back position groups

Forwards ($N = 51$)	Whole game ($N = 19$)	Starter ($N = 16$)	Finisher ($N = 16$)	Whole game vs. Starter	Whole game vs. Finisher	Starter vs. Finisher
Time playing (mins)	96 ± 12#	61 ± 11*	30 ± 13*#	*Most likely* very large (−3.03 ± 1.03)	*Most likely* very large (−5.3 ± 1.5)	*Most likely* very large (−2.59 ± 0.95)
Relative distance ($m \cdot min^{-1}$)	68 ± 6	66 ± 6	71 ± 9	*Unclear* (0.32 ± 0.56)	*Unclear* (0.41 ± 0.74)	*Unclear* (0.69 ± 0.73)
High-speed distance ($m \cdot min^{-1}$)	10 ± 4	12 ± 5	17 ± 9*#	*Unclear* (0.45 ± 0.66)	*Very likely* large (1.47 ± 0.95)	*Very likely* medium (0.95 ± 0.85)
Acceleration frequency (min per accel.)	11 ± 20	10 ± 21	6 ± 10*#	*Unclear* (0.12 ± 0.54)	*Very likely* large (1.39 ± 0.88)	*Very likely* large (1.32 ± 0.92)
Impact frequency ($>5G \cdot min^{-1}$)	8.3 ± 2.7	11.3 ± 2.5	12.8 ± 2.6	*Unclear* (0.99 ± 0.63)	*Likely* large (1.50 ± 0.75)	*Likely* small (0.55 ± 0.82)
Backs ($N = 49$)	**Whole game (N = 27)**	**Starter (N = 19)**	**Finisher (N = 3)**	**Whole game vs. Starter**	**Whole game vs. Finisher**	**Starter vs. Finisher**
Time playing (mins)	96 ± 8#	61 ± 14*	24 ± 9*#	*Most likely* very large (−3.22 ± 0.93)	*Most likely* very large (−8.55 ± 1.96)	*Most likely* very large (−2.55 ± 0.99)
Relative distance ($m \cdot min^{-1}$)	65 ± 4	71 ± 8	65 ± 15	*Likely* medium (1.01 ± 0.60)	*Unclear* (0.02 ± 0.59)	*Unclear* (−0.53 ± 0.61)
High-speed distance ($m \cdot min^{-1}$)	12 ± 3	16 ± 5	16 ± 2	*Likely* medium (1.01 ± 0.60)	*Unclear* (1.44 ± 1.35)	*Unclear* (0.05 ± 0.59)
Acceleration frequency (min per accel.)	5 ± 10	5 ± 9	4 ± 6	*Unclear* (0.24 ± 0.52)	*Unclear* (0.78 ± 3.05)	*Unclear* (0.48 ± 2.77)
Impact frequency ($>5\ G \cdot min^{-1}$)	9.5 ± 3.1	9.6 ± 3.1	9.1 ± 6.4	*Unclear* (0.03 ± 0.59)	*Unclear* (−0.14 ± 3.38)	*Unclear* (−0.16 ± 3.33)

Notes: Data presented as mean ± SD. Role indicates whether a player completed the whole game (whole), started the game and was substituted (starter) or did not start the game and came on as a substitute (finisher). Acceleration frequency indicates how regularly players exceeded the acceleration threshold of 2.75 $m \cdot s^{-1}$. Impact frequency indicates the number of time that player collision-forces exceeded 5G. *,# indicate significant difference from whole game and starters respectively ($P < .05$). Paired comparisons are a statement of the likelihood and magnitude of effects (Effect size ± 95%CI). Likelihood for substantial effects are described as possibly (25–75%), likely (75–95%), very likely (95–99.5%) and most likely (>99.5%).

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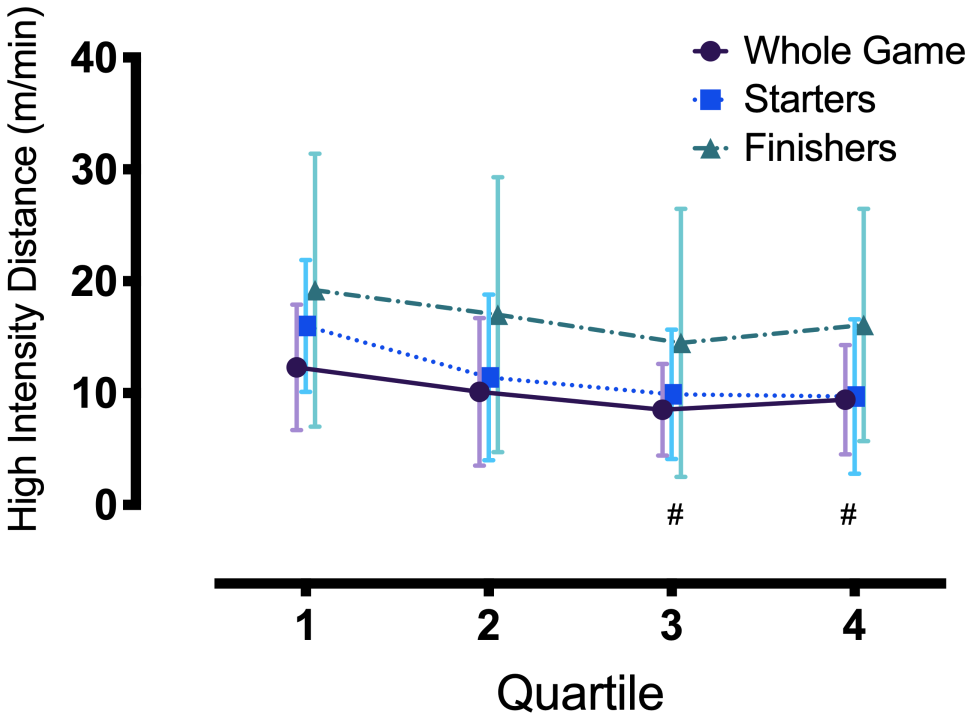
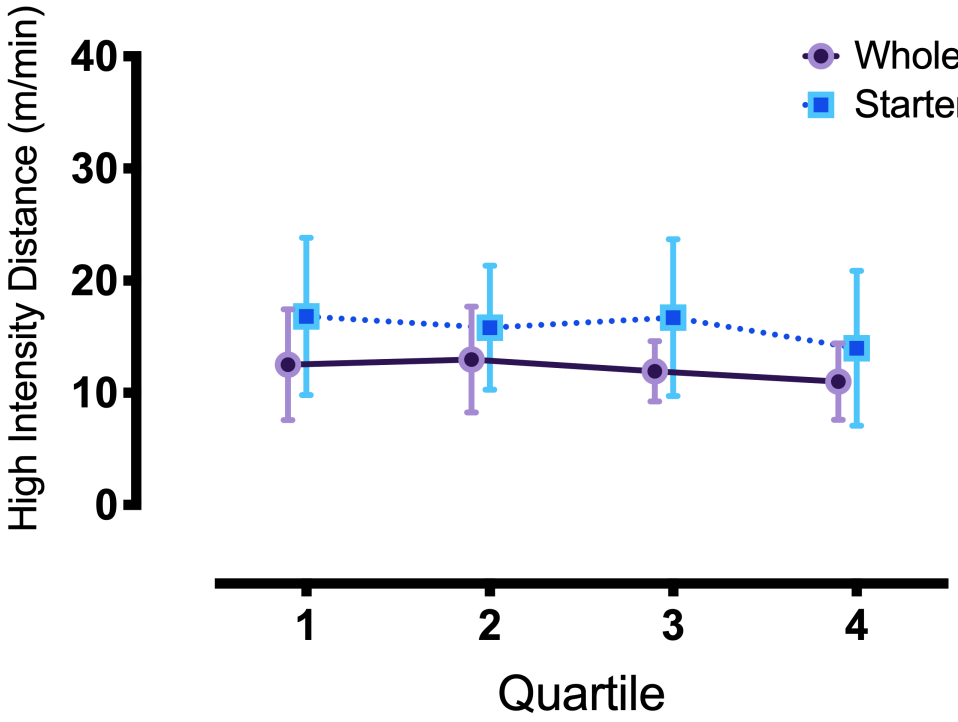
Results – Temporal effects

Forwards



Backs



Forwards showed significant and practically meaningful reductions in running distance, high speed running distance and acceleration frequency over time

Backs no change in playing intensity over time

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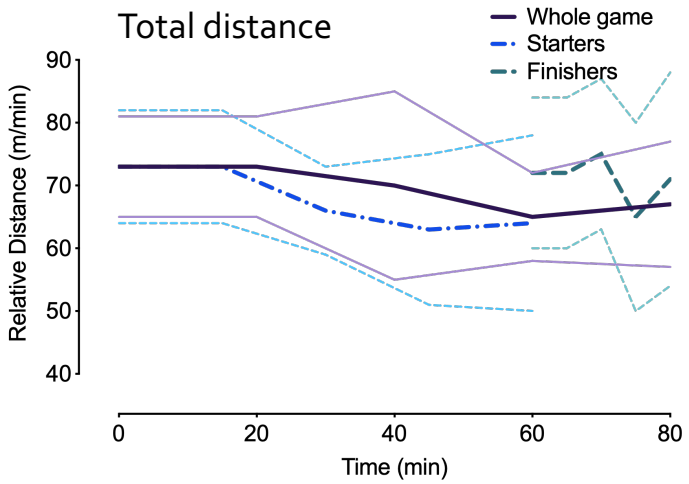
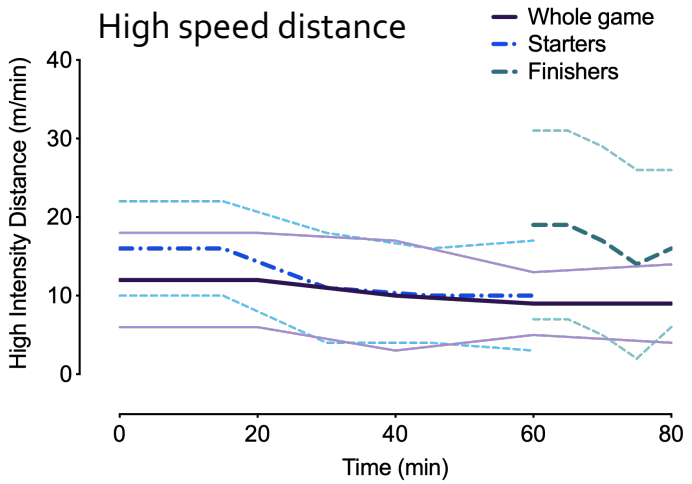
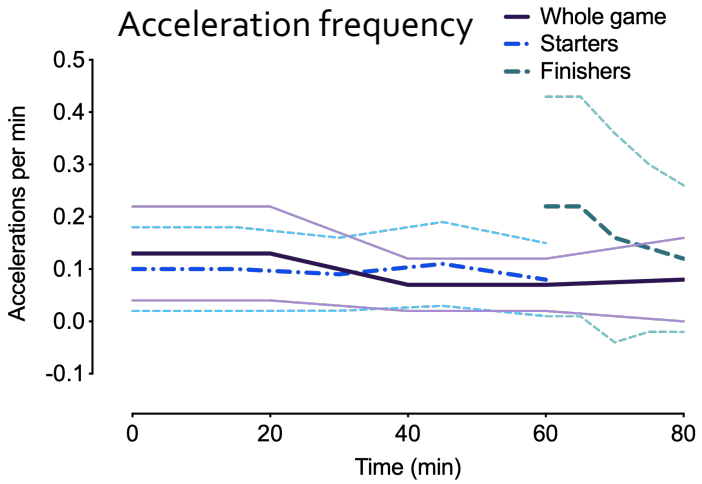
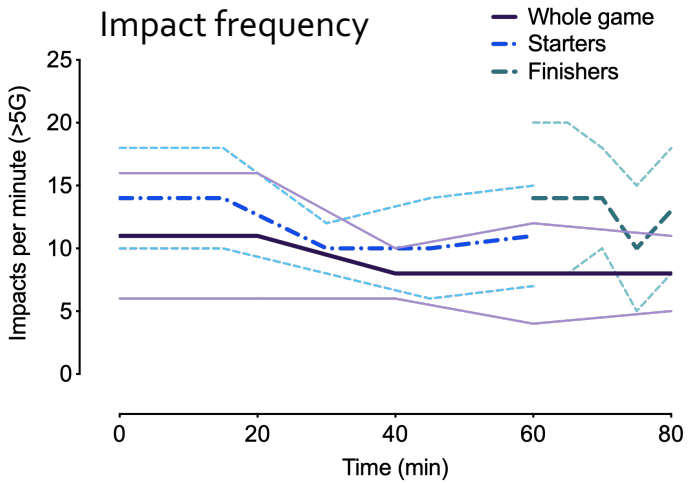
Results – Finishers vs Whole game players









For forwards there were significant and practically meaningful differences in all physical performance parameters vs. whole game players.

These differences diminished over time, but were still practically meaningful at the end of the game.

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Practical implications

- Forwards reduce playing intensity of time, backs don't
  - Load the bench with forwards!

- Plan the timing of substitutions carefully to maximise the bout effect
  - Players work harder if they know how long they will play for!

- Difference in playing intensity between whole game players and finishers is of concern
  - Investigate whether this is linked to injury risk!

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Thanks for listening

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ORIGINAL ARTICLE

Pacing characteristics of whole and part-game players in professional rugby union

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